

1. Resilience Planning

The Houston-based Thermal Energy Corporation (TECO) has provided reliable, cost-effective and energy efficient heating and cooling services to institutions in the Texas Medical Center (TMC) since 1969. TECO uses district energy and CHP technologies to provide chilled water and steam to the TMC campus, which consists of 16 institutions and 20.7 million square feet of customer buildings. TECO's main goal is to provide reliable and resilient power and thermal services for \$22 billion worth of business as the TMC. Hospitals and research institutions are ideal sites for CHP and district energy systems as they always require a steady supply of electricity and hot water.

The TMC originally had a traditional district energy system with backup emergency generators for when grid power was unavailable. The [CHP system](#) at the TMC has played a large role in sustaining critical operations and improving resiliency for the entire campus. The purchase and installation of the CHP system was facilitated by a financial assistance grant awarded to TECO under the American Recovery and Reinvestment Act of 2009 (ARRA). The CHP system has allowed TECO to reduce its consumption of electricity from the grid, enhance operating efficiency and improve air quality, and to ensure a source of uninterrupted power supply, thus [protecting the TMC campus](#) from grid outages. The CHP system is also able to meet 100% of the TMC campus' peak power requirement while still exporting excess power to the grid. TECO was also able to convert its traditional district energy system to a CHP district energy system.

Recognizing that the plant is located in the 100-year floodplain of Brays Bayou, TECO has also taken steps to enhance the structural integrity of the TMC buildings for wind speeds up to 110 miles per hour and installed a flood wall to protect against a 500-year flood event. Flooding (~20 inches of rainfall) during tropical storm Allison had caused severe damage to electric equipment throughout the campus. However, with the enhanced infrastructure from flood mitigation projects, there was no damage to electric infrastructure during Hurricane Harvey (~50 inches of rainfall), and the [48 MW CHP system](#) was able to provide power and thermal energy during and after the storm. This allowed staff to provide care and operate critical equipment even though most of the surrounding utility grid was without power.

2. Program or Project Implementation

As discussed previously, TECO received \$10 million in funding from the US DOE's ARRA of 2009 to build the CHP plant at the TMC. The private-sector cost share totaled \$62 million. In order to meet the rapidly growing thermal loads of the TMC facility, TECO installed the following technologies:

- A new high efficiency natural gas-fired CHP system capable of producing 48 MW of on-site generation and 330,000 lbs of steam per hour;
- A 75,000 ton-hour (8.8 million gallon) thermal energy storage tank; and
- An additional 32,000 tons of chilled water capacity

The construction and implementation of the system has had several benefits. The project created immediate engineering, manufacturing and construction jobs, as well as long-term maintenance and servicing positions. The CHP system has improved overall system efficiency, reduced carbon dioxide and particulate emissions and saved TECO a considerable amount of money while providing uninterrupted energy services.

3. Lessons Learned

CHP for Resiliency Accelerator Partner Profile

The CHP project at the TMC has been more beneficial than originally anticipated, mainly due to the continuous optimization of the equipment, such as chillers, storage tanks, etc. The project has also been able to take advantage of energy markets and sell power to ERCOT for financial benefits. TECO has learned that CHP systems can ensure energy security for critical facilities while creating cost savings and reducing emissions. The estimated benefits of the CHP system at the TMC have been:

- An increase in operating efficiency of the system to almost 80% from 42%;
- Reduction in NOx emissions of 302 tons/year;
- Reduction in CO2 emissions of 305,000 tons/year;
- Reduction in carbon emissions of 83,000 tons/year;
- Projected cost savings of \$200 million over 15 years, including reductions in customer rates; and
- The ability to serve 100% of the TMC's peak electric load

Moving forward, TECO is focused on sharing resiliency practices and actual implementation experiences with other stakeholders. TECO is also interested in learning about ways to sustain implemented resiliency plans. There are several new buildings being constructed on the TMC campus, and at some point additional power generation will be needed. TECO plan to use the same approach that has worked in the past to add generation infrastructure and continue to provide reliability and resilience benefits to the expanding medical campus.

4. Additional Information

- ▶ [DOE Case Study – Combined Heat and Power System Enables 100% Reliability at Leading Medical Campus](#)
- ▶ [Final Environmental Assessment for the Thermal Energy Corporation Combined Heat and Power Project, Houston, Texas](#)
- ▶ [CHP Installation Keeps Hospital Running During Hurricane Harvey](#)
- ▶ [Texas Medical Center CHP Project Profile](#)